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HABITABLE ATTICS

NEW POTENTIAL FOR AN OLD IDEA

HABITABLE ATTICS:

NEW POTENTIAL FOR AN OLD IDEA

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INTRODUCTION

The Canadian demographic profile has changed dramatically during the past century. Most notable has been the shift in family structure from multi-generational to smaller, one-generation households. This shift has directly caused the number of households to increase at a greater rate than the population, with a correspondent increase in the number of non-family and other smaller households. From 1971 to 1986, the number of households increased 49 percent, from 6 to 9 million; the population grew 17 percent, from 21.6 million to 25.3 million. Also significant is the increase over the past 25 years in the number of one-parent families, with the majority being headed by women and, increasingly, young women. In 1986, the number of female-headed households reached almost 0.7 million, while the number of male-headed households neared 140.000. Another trend indicates that household size has been declining, from an average of 5.2 in the late nineteenth century to 2.8 today — partly as the result of an overall decline in fertility, despite the postwar baby boom.

In terms of household composition, an appreciable portion of the Canadian population is made up of elderly persons — many in the low-income category. Statistical data indicate that the population has aged considerably, with almost 2.7 million Canadians, or 10.7 percent of the nation's population, aged 65 years or older. Almost one fifth of these elderly persons are over 80 years. Population aging will continue, and projections estimate that by 2001 almost one in seven Canadians will be a senior citizen.

This "Grey Wave" is already having a tremendous influence on housing trends in terms of design, composition and financial instruments.

The increasing rate of new household formation, combined with the aging of the population and the fragmentation and decrease in the size of households, means that a greater variety of housing options will need to be offered. The market will have to respond to the specific needs of young first-time buyers, couples with or without children, middle-aged and elderly persons.

CHANGES IN THE FAMILY STRUCTURE

Changes within the family structure require that housing be more flexible and adaptable, to accommodate the needs of this increasingly diversified clientele with varied economic conditions and social lifestyles. The building industry will be challenged to develop new designs and introduce technological advances in order to help families overcome the following conditions:

1) For young married couples in search of their first home, the lack of modest accommodation is a main deterrent to affordable homeownership. Housing innovations that improve affordability with modest and flexible designs can help to ease the financial crunch.

2) Affordability is also a major factor for the majority of couples with young families. Buying a house that can expand as their need for space increases is paramount.

3) As children leave home, married couples find that they require less space. Studies also show an increase in two-generation families (adult children in their sixties and seventies caring for their aging parents). Both situations demand flexibility in household design.

4) Healthy elderly couples still in their own homes are, on the whole, faced with a need for less living space and more financial assistance. Again, a house that can be readily converted or redesigned to accommodate rental space is an acceptable and sensitive option for this population group.

UNUSED ATTICS IN NEW HOUSING

To accommodate the changing housing needs of a range of family types, the homebuilding industry is continually arriving at new types of housing or new ways of looking at the existing housing unit. One approach worth exploring is the building of habitable attics in new housing. In this way, single-family housing can be redesigned to accommodate a variety of needs: a young family (affordable housing, as the attic can remain unfinished until needed); a growing family (need for more living space); and an older, shrinking family (the finished attic or part of the ground floor can be used as rental space and therefore provide needed extra income).

Given the potential benefits, Canada Mortgage and Housing Corporation explored the idea of reclaiming the attic. The Corporation wanted to demonstrate that habitable and economical attics can be built and that they can make an important difference to the house buyer. Habitable attics can ease the entry into homeownership for first-time buyers; they can also increase tenure flexibility for families as their needs grow and change through the life cycle. An added feature is that habitable attics can anticipate the use of solar energy on their steeply inclined roofs.

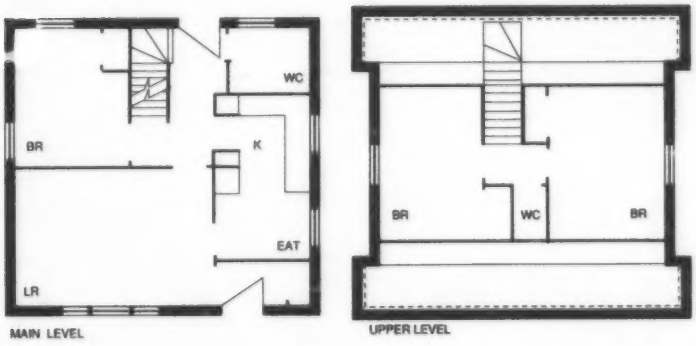
The traditional method of roof framing enclosed a usable, often substantial, space under the rafters. Historically, attics have been very common and have served as storage or sleeping quarters. The most obvious starting-point for this research was to examine existing structures to identify ways that attic space could be introduced into homes without delaying construction or increasing cost.

Cut roof attics were common in pre- and post-war housing until the manufactured low-pitch roof truss was introduced in the housebuilding industry in the 1950s. Although the truss speeded up construction and used lumber more efficiently, it eliminated the attic as a habitable space.

Technological advancements in the last two decades have facilitated the design and construction of roof trusses that can make an attic habitable. With advances in truss manufacturing — composite wood members, roofing materials, panelized building envelopes and skylights — construction methods could be developed to regain the use of the attic. This report identifies the variety of attic structures of the pre-fifties era and shows how, by applying current manufacturing technologies, construction systems can be developed that are efficient and cost-competitive and can replicate most of the traditional attic forms. (See *Figures 1* and *2* for examples of a detached house featuring an attic built before the introduction of the common truss and a detached house with attic potential.)

FIGURE 1

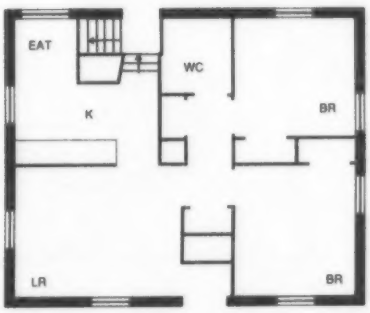
EXAMPLE OF A DETACHED HOUSE WITH ATTIC BUILT BEFORE THE INTRODUCTION OF THE COMMON TRUSS



Main level 59.3 m²
Upper level 31.5 m²
Total 90.8 m²

FIGURE 2

EXAMPLE OF A DETACHED HOUSE WITH ATTIC POTENTIAL



Main level 67.7 m²
Potential upper level 34.2 m²
Total 101.9 m²

FINDINGS

Several truss systems that meet the requirements of construction speed and economy are available. Of these, three truss systems share many desirable attributes for attic construction:

- engineered and preassembled
- comparable in weight to common trusses
- easy to install with ordinary tools
- amenable to skylights or dormers
- easily insulated to code levels
- designed with a pony wall in place

Above all, the three systems are the most economical — for homeowners and builders alike.

Using one of these truss systems, it is more economical to build a house with a habitable attic than either a bungalow or a two-storey house. It is estimated that a considerable reduction in the cost of the new attic trusses will be possible when production quantities become comparable to those of the common truss.

SUMMARY

The habitable attic appears to have great potential for meeting some of Canada's changing housing needs. Builders and users are likely to benefit by using this approach to house design. Of the three most common housing forms — bungalow, two-storey and one-storey with unfinished attic — the latter is the most economical and flexible.

As the housing market is affected by socio-demographic factors — smaller households, fragmentation of existing households, low birth rate, population aging — new housing options must be made available. One such option is to design or construct housing with flexibility for expansion or reduction of space. Thus, housing can grow with a family — a desirable feature, both sociologically and economically. In housing that has a constant floor area with no flexibility, sections of a dwelling may be underused during the early and later years of a family's life and overcrowded during the middle years, when family size is largest.

Compared with other options, including expansion into the basement and building an addition, developing the attic is less expensive than adding onto the existing house. It also provides higher-quality living space than a basement, where ventilation and moisture problems could arise.

For the prospective homeowner, a dwelling unit with an unfinished attic space has the potential of being developed into additional living quarters when the need arises. Young, first-time buyers with no children and a modest income will probably prefer an unfinished attic space to an already finished two-storey house if it means lower mortgage payments. This group also has the choice of converting an attic into income-generating space, and using the additional income to reduce overall costs.

Couples with children can finish the attic space to make it habitable for extended-family living. Also, the possibility of having separate living quarters in the attic for teenage or adult children is very attractive for mature homeowners who have the economic means to exercise this option.

For elderly households, the habitable attic is a relatively inexpensive way of bringing in rental income. If it has not already been separated physically from the rest of the house, this attic space can be designed, at relatively low cost to the homeowner, with a separate access and entrance area, thereby making it ideal for renting out. The elderly homeowner will not only garner valuable extra income but will also be able to remain in familiar surroundings — another positive element of this option.

The principal advantages to making the attic habitable for homeowners are as follows:

1. **Ease the entry into homeownership**
First-time buyers can purchase a 56 m^2 house with an unfinished attic at a lower cost and develop the 56 m^2 attic later. The finishing can be done by the owner in stages or by contractors at a later date. Finishing an attic is relatively easier than other renovation work, given the separation of the space from the rest of the house. The same holds true for people who aspire to own a large (186 m^2) house, which they cannot afford on their current income.

Lower initial cost and mortgage payments are a real attraction.

2. **Increase tenure flexibility**
Families change in size through their normal cycle. Neighbourhoods also change as communities grow. A family can meet all its space needs or generate income when they own a house with an attic that can be made habitable. Children, grandparents or tenants could be accommodated in self-contained areas of the house. This becomes feasible when there is room to expand into the attic. A small premium on the cost of the house will buy that flexibility.

3. **Increase home value**
For families, the benefit of selling a house with habitable attic space is obvious. The house will have a higher resale value because the habitable space is more versatile and can thereby cater to the needs of a new family with a new set of space requirements.

Attic space that can adapt to a variety of household needs is a very attractive option. The flexibility of such an arrangement means that a habitable attic can be used for auxiliary activities, for extended family living or for renting out.

HABITABLE ATTICS BENEFIT THE HOMEBUILDING INDUSTRY

More affordable and flexible housing options will become increasingly important as the housing market becomes more fragmented. To satisfactorily meet the varying demands of a varying clientele, the homebuilding industry will be forced to develop new designs and production methods.

By constructing homes with habitable attic space — finished or unfinished — the homebuilding industry will benefit in several ways:

1. **Marketability**
Internal house design that is flexible will make the house more appealing to first- and second-time buyers. Builders will be able to market what was previously wasted space.

High-pitch roofs are appropriate for the Canadian climate and have been traditionally seen as a symbol for "home" and "shelter." This image persists in the buyer's mind and makes this roof form appealing.

2. **Market Diversification**
By providing a flexible house design, the industry will be directly contributing to the development of a new housing alternative that has wide appeal to first-time buyers who previously may have been unable to enter the housing market. Moreover, the habitable attic has wide appeal to others, including the elderly, who can rent out the space to increase their disposable income.

Introducing an option that has so much flexibility demonstrates sensitivity on the part of the industry to the needs of a diverse consumer market.

3. **Economic Considerations**
A house with an unfinished attic that can be made habitable with one of the three recommended truss sytems is a more economical option than a finished bungalow or two-storey house. (See "Economic Benefits of Making the Attic Habitable.") These savings can be passed directly on to the homebuyer. In addition, the number of first-time buyers who would want to purchase a home with an unfinished attic is likely to increase.

4. **Construction Ease**
As with the standard roof truss, the three alternative trusses recommended in this report are relatively easy to install and transport, and accommodate a more efficient use of space.

HABITABLE ATTICS BENEFIT THE MUNICIPALITY

Municipalities will also benefit — albeit indirectly — by supporting the concept of the habitable attic. This concept holds the following benefits:

- Unlike some other housing alternatives, a house built with habitable attic space does not disrupt the character of a neighbourhood when it grows or changes occupancy. There is no tampering with lot size and configuration, and the integrity of both structure and surroundings remains intact.

- The growing number of mature and elderly households will be able to stay in familiar surroundings, where they have established social ties.

- The potential for separating an attic space for renting out or for accommodating adult children will enrich the existing housing stock, including rental stock. The creation of much-needed rental housing and smaller converted units can help alleviate the affordability problem for both first-time buyers and tenants. There also may be economic benefits to municipalities through increased assessment values.

SUMMARY

Assuming that at various stages of their lives, people may need more or less space for their dwelling needs and more or less income to support their dwelling costs, housing with habitable attic space represents housing with that built-in flexibility. Finishing and converting the habitable attic is relatively easy and inexpensive.

DESIGNING WITH THE HABITABLE ATTIC IN MIND

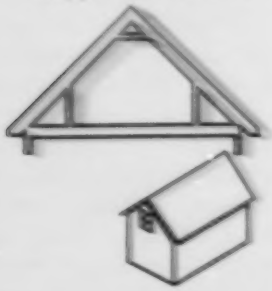
Prior to the 1950s, when the prefabricated lightweight residential roof truss was introduced in Canada, the typical attic in many homes across the country — regardless of architectural style — to some degree provided accommodation space. In row housing and smaller dwellings, the attic space might have consisted of two bedrooms and perhaps a bathroom. In larger dwellings, the space was either used for storage or for secondary living space (sometimes servants' quarters).

Several shapes accommodate this type of attic space: basic pitched roof, pitched roof gable dormers, pitched shed-type dormers, New England roof, mansard, double hip and gambrel (see *Figure 3*).

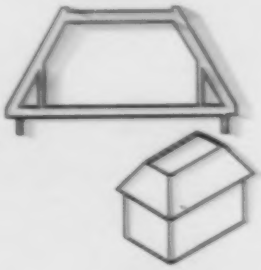
FIGURE 3

SEVEN TYPICAL ROOF SHAPES BUILT BEFORE THE LIGHTWEIGHT ROOF TRUSS WAS INTRODUCED IN THE 1960s

Basic Pitched Roof
(Typical in Canada)



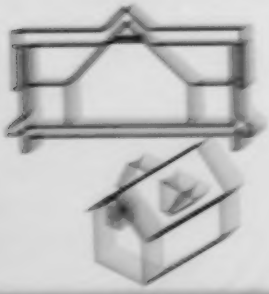
Mansard
(Common in Quebec)



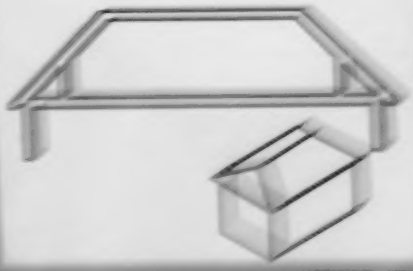
New England Saltbox
(Common in Quebec)

(not strictly an attic)

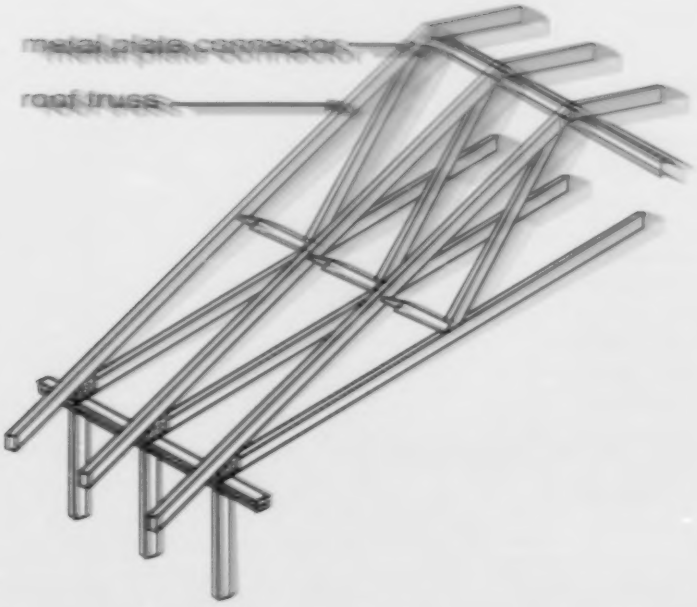
Pitched Roof Gable Dormers
(Typical in Canada)



Double Hip
(Common in eastern Canada)



Pitched Roof Shed-Type
Dormers (Common in Toronto,
western Canada)



Features of the low-pitch roof truss include:

- possible variation in roof slope, depending on the roof covering;
- one-step provision of a surface for the roof sheathing, a surface for the ceiling finish material and space for insulation;
- reduction in the amount and size of wood; and
- much-reduced framing time.

Plate 1: A one-and-one-half storey home with attic space partially in the roof.

Plate 2: Two-storey home where attic is under a gambrel-style roof.

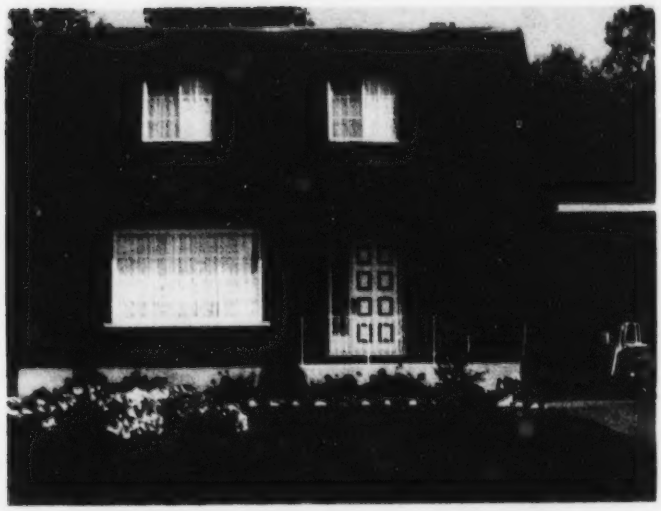


Plate 3: A house with a mansard roof attic.

Plate 4: Row houses with habitable attic spaces.

ALTERNATIVE TRUSS SYSTEMS

Current manufacturing technologies exist for the widespread production of truss systems that are efficient and cost-competitive and that could regain the use of the attic space.

But for an alternative truss system to provide not only a habitable space but be acceptable to the homebuilding industry, it must satisfy several criteria, ranging from adequate ceiling height and appropriate roof slope to support for a variety of structural loads and capacity for adequate insulation.

Specifically, the following conditions need to be met:

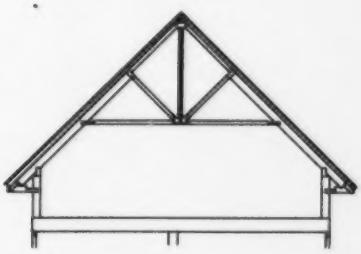
- **Roof Slope, Unit Width and Ceiling Height**
  For an attic to be habitable, one half to three quarters of the floor area should have a minimum ceiling height of 2.3 m. Sufficient habitable space requires an attic roof slope of between 35 and 45 degrees. The latter is preferable.

- **Load Requirements**
  Habitable attics must be built to withstand occupancy loads in addition to the other load requirements — snow or wind — that will be placed on them. Two options are available with an alternative truss system: to install an interior load-bearing wall that supports the attic floor joists at or near their centres, below the attic floor; or (the more expensive of the two options) to make the bottom cord of the new truss deeper, capable of spanning the entire width of the house.

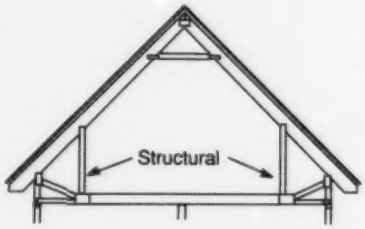
- **Proper Insulation, Air and Vapour Barriers, and Ventilation**
  Insulation and proper air and vapour barrier sealing are important considerations in framing a livable attic space. For the outer floor, walls and ceiling beyond the habitable area, batt or rigid foam materials are recommended; and insulation *R* values for the outer attic floor, attic ceiling, end walls and knee walls should be equal to those required by the building code for equivalent design conditions in other parts of the house. For attics which are or may be finished, the space should also be protected by a vapour/air barrier applied on the warm side of the insulation. A ventilated roof must also meet several conditions: cross-ventilation should be provided at the eaves/soffit and ridge or gable ends; and several vents (soffit and roof) should be used. The idea is that ridge vents or gable vents be combined with eave vents to provide effective ventilation of the insulated spaces.

Twelve alternative roof framing systems currently available (see *Figures 5* and *6*) satisfied the overall requirements. To be precise, they fulfilled the following criteria: provided the necessary amount of space for living; were structurally sound; were factory-assembled, for the most part; allowed for the easy installation of services; were lightweight; and were quick to install. However, three of these systems ("A," "B" and "C") proved to be the best, sharing the following desirable attributes:

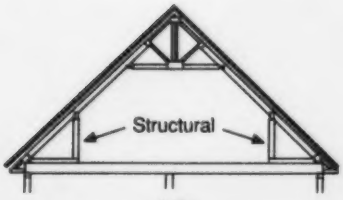
- engineered and pre-assembled trusses
- comparable in weight to the common trusses
- easy to install with ordinary tools
- easily adapted for skylights and dormers
- easily insulated to code levels
- designed with a pony wall in place



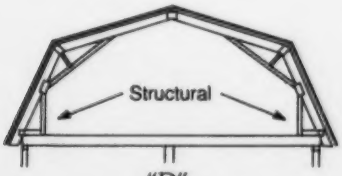
"A"
Truss with integral pony wall



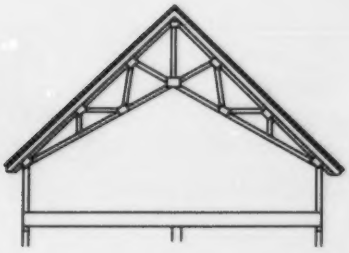
"B"
Truss with integral floor and pony wall



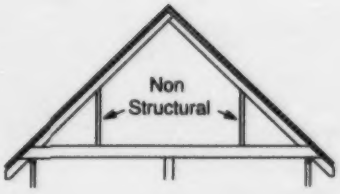
"C"
Truss with integral pony wall



"D"
Gambrel truss



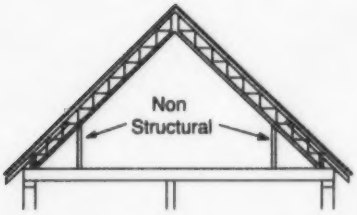
"E"
Scissors truss (on separate pony walls)



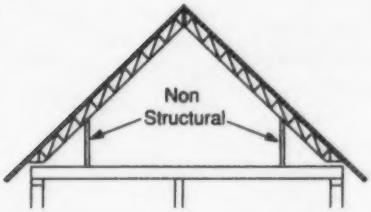
"F"
Stressed skin plywood panels

FIGURE 6

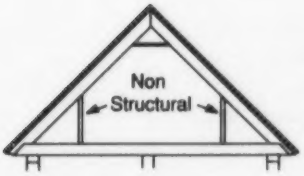
ATTIC FRAMING SYSTEMS USING RAFTERS



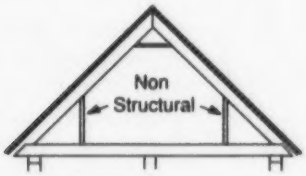
"G"
Steel pipe truss rafters



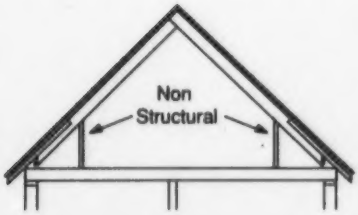
"H"
Flat laid 2x4 truss rafters



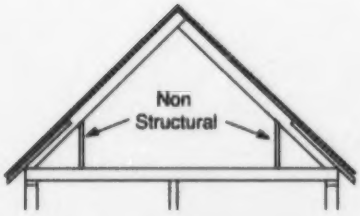
"I"
Laminated veneer lumber



"J"
Parallel strand lumber rafters



"K"
Plywood web rafters



"L"
Plywood 'I' beams with integral rigid insulation

SYSTEM "A"

Of the three recommended systems, System "A" (see *Figure 7*) seems to be the best suited for attic construction for several reasons. It is considerably more efficient in the cost per floor area ratio; it is easier to insulate and make airtight; it is easier to transport and lift because it can be delivered to the site in two halves; and it is easier to finish on the exterior since it provides its own soffit supports. Some of its characteristics are:

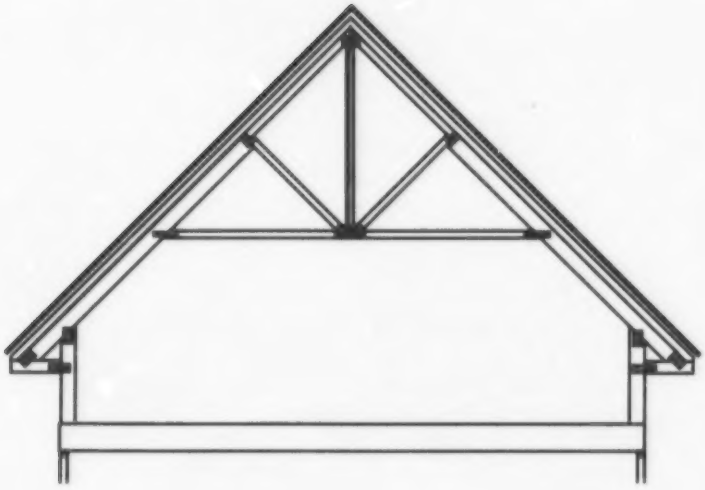
Structural
— acts as a standard house truss
— pony walls are a part of the truss, so need not be constructed on-site
— delivered to site in two parts
— simply installed because the attic floor is already in place

Insulation/Ventilation
— insulation easily applied to knee walls and ceilings
— air/vapour barrier at joint of outer attic floor easily detailed
— combination of ridge, eave and gable vents for effective air movement and ventilation
— soffit roof ventilation

Other
— allows use of the entire attic floor
— skylights and dormers easily installed
— can be used in semi-detached units and townhouses if the truss spans the length of the unit

FIGURE 7

SYSTEM "A" (TRUSS WITH INTERNAL POST WALLS)



System "B" (see Figure 8) is slightly less costly to use in attic construction than System "A." This advantage is offset by the smaller floor area and the difficulty of installing a continuous air/vapour barrier. However, it too offers many of the same attributes as the first choice.

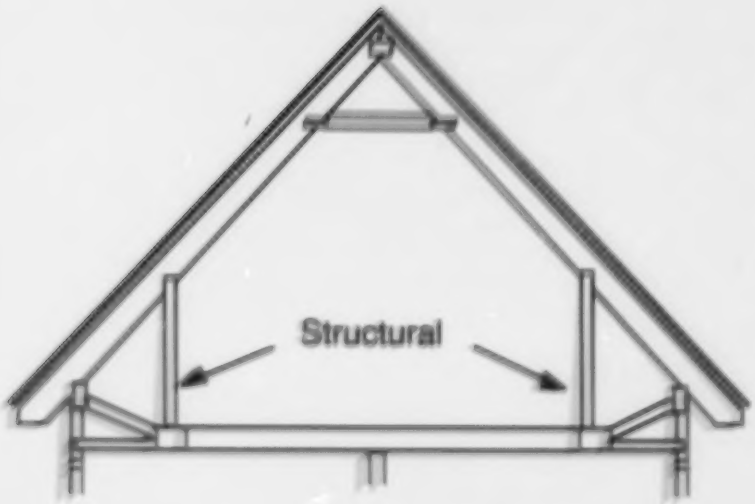
Structural
— integral floor joists, so does not need a separate floor joist system
— pony (knee) walls part of the truss
— for larger spans, may need a crane because of its weight

Insulation/Ventilation
— combination of ridge, eave and gable vents for effective air movement and ventilation

Other
— skylights and dormers easily installed
— can be used in semi-detached units and townhouses if truss spans the length of the unit

FIGURE 8

SYSTEM "B" (TRUSS WITH INTEGRAL FLOOR AND PONY WALLS)



SYSTEM "C"

System "C" (see Figure 9) is the most expensive of the three alternative truss systems. Like System "B," it offers disadvantages of cost and the difficulty of installing a continuous air/vapour barrier. It has the following attributes:

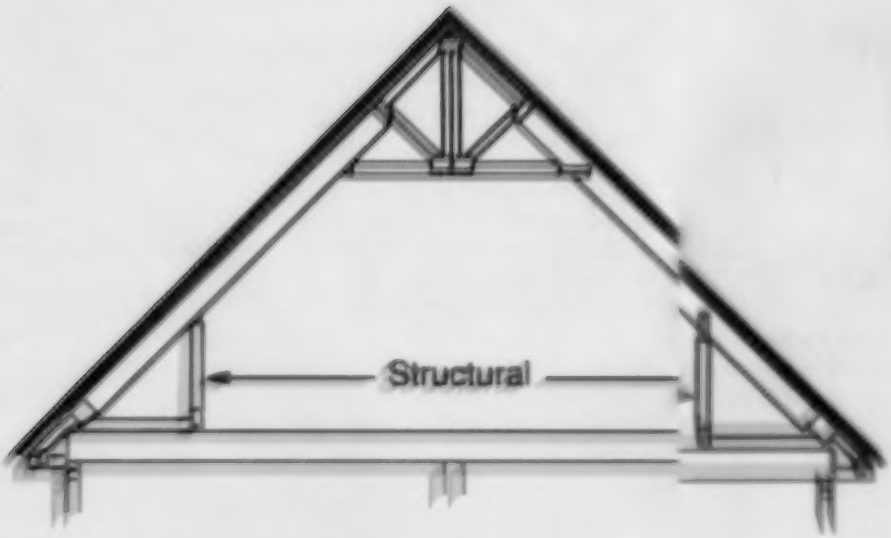
Structural
- *truss elements and floor joists erected separately but act as one unit once they are connected*
- *floor system already in place*
- *pony (knee) walls part of the truss*

Insulation/Ventilation
- *additional thickness of batt insulation can be accommodated*
- *the provision of a continuous air/vapour barrier more difficult than in System "A"*

Other
- skylights/dormers easily installed
- can be adapted for use in semi-detached units and townhouses if the truss spans length of the unit

FIGURE 9

SYSTEM "C" (TRUSS WITH INTEGR
PONY WALLS)



The Truss Rafter System has been used in housing projects in many parts of Canada, particularly in Quebec, where steep roofs are the dominant style.

They can be applied to any housing form, detached, semi-detached or townhouse, with the same ease as common trusses, and produce the flexibility and growth potential impossible with current practice.

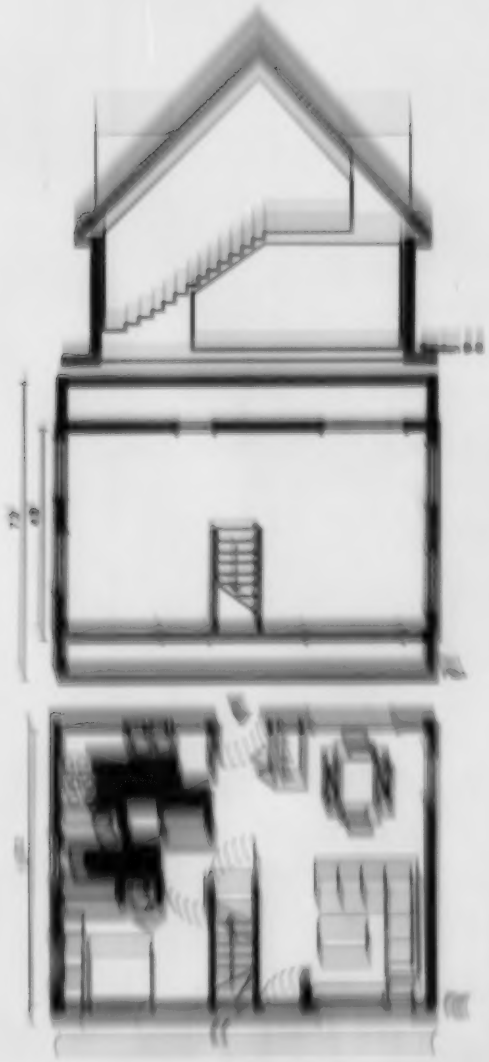
Their application makes the most sense, however, in assisting first-time buyers to enter the homeownership market.

One of the layouts in Figure 10 is a 3-bedroom bungalow of approximately 100 m² with a 3-bedroom, 2-bathroom basement apartment. Only two bedrooms are finished in the attic.

Similarly, a 2-bedroom townhouse can be designed to grow into a 4-bedroom townhouse or incorporate a separate rental unit.

The traditional 3-bedroom bungalow of approximately 100 m² can incorporate an almost equal area in its attic, which can easily be made into a one- or two-bedroom self-contained unit.

The examples in Figures 10, 11 and 12 illustrate only a few of the many possible ways of using the attic as growth space.



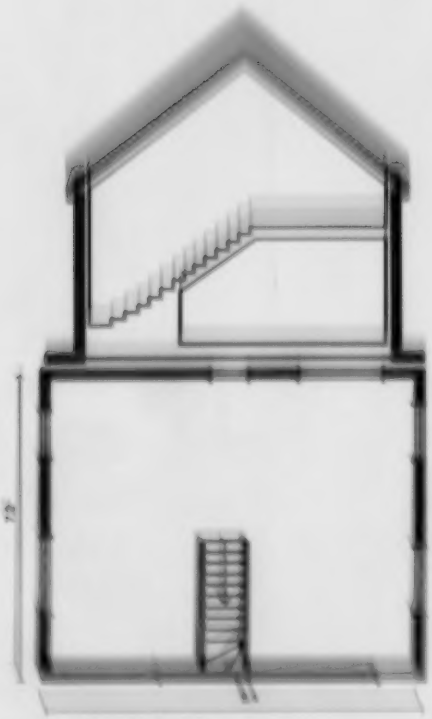
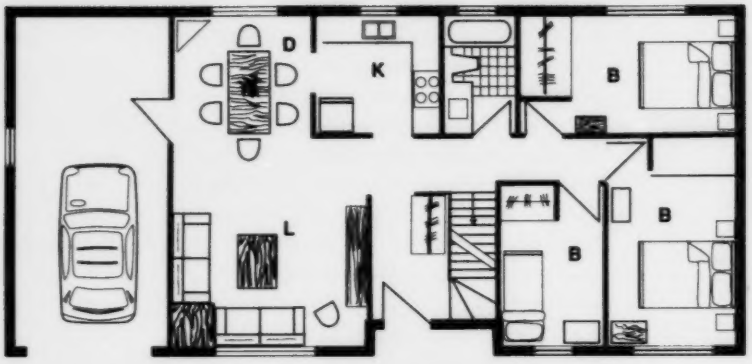
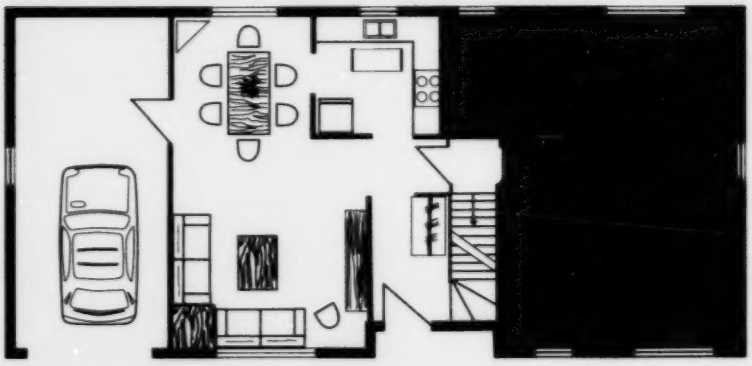


FIGURE 12

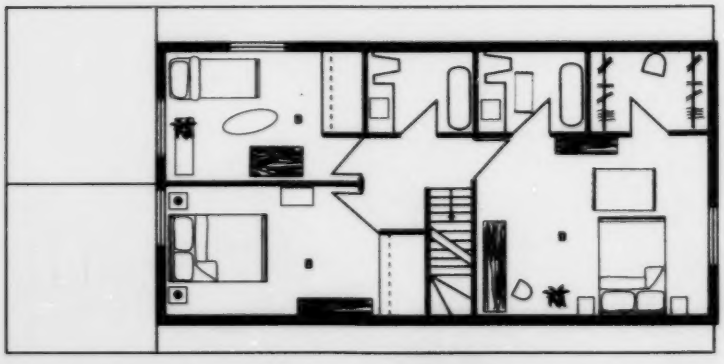
EXAMPLE OF A BUNGALOW WITH ATTIC POTENTIAL



UNCONVERTED (WITH ATTIC POTENTIAL)



CONVERTED (GROUND FLOOR)



CONVERTED (HABITABLE ATTIC)

SUMMARY

Unusable attic space is a recent phenomenon, traceable to the introduction of the lightweight "common" truss in the 1950s. Although this technology was introduced by the homebuilding industry for its labour-saving and cost-efficiency qualities, its adoption deprived homeowners of an area of the house traditionally used for valuable living or storage space.

However, recent manufacturing technologies have developed suitable alternative truss systems that will reclaim the unused attic space and satisfy the requirements of builders. Three systems in particular, out of 14 currently available, have all the advantages of construction ease offering by the lightweight truss. No doubt, as more and more members of the homebuilding industry accept these alternatives, their cost will lower and the habitable attic option will become even more attractive financially.

ECONOMIC BENEFITS OF MAKING THE ATTIC HABITABLE

A habitable attic space can be provided at reasonable additional cost. Indeed, based on a partial analysis — assuming that all the features excluded in the costing of traditional construction are also excluded in the alternative truss systems — it is more economical to build a one-and-a-half storey home with finished habitable attic space than to build either a two-storey home or a bungalow with the common truss system.

Cost estimates, which exclude elements common to both alternatives, bear this out (all estimates are in 1989 dollars):

- a finished bungalow of 100 m^2 with three bedrooms is $52,426 (not counting land costs, etc.); and
- a one-and-a-half storey home with 60 m^2 of finished space and an unfinished attic area of 40 m^2 costs $41,770. The cost for finishing the attic at a later date is estimated at $8,000.

The comparative per m^2 costs of these two options are $524 and $495, respectively. Even the lower figure can decrease to $429 per m^2 if the attic truss of System "A" is used. This truss system uses the entire attic floor area, equivalent to the area of the ground floor.

Such a comparison is justifiable when it is considered that the attic option can provide the same living area at some future date, when the first-time homebuyer can afford to finish the attic. A later completion of the attic will, in some cases, allow the owner to do some of the work.

ECONOMIC BENEFITS FOR THE HOMEBUILDING INDUSTRY

The obvious advantage of building a house with usable attic space is its saleability to a segment of the population previously unable to enter the housing market. The builder can sell this type of house at an affordable price to first-time homebuyers, who will be able to purchase such a house for less money than other types of single-family homes.

Another advantage to the homebuilding industry is the expected cost efficiency of using the three recommended systems versus building either a bungalow or a two-storey house with the common low-pitch truss. It is perfectly conceivable that the recommended systems will become even more efficient as industry take-up increases.

COST COMPARISONS: ALTERNATIVE TRUSSES VERSUS THE COMMON TRUSS[1]

Three examples with finished attic compared to a one-or two-storey equivalent space. The costs do not include land and exclude elements common to both solutions.

Example 1

Costs of putting 100 m^2 (1,076 ft^2) on one floor and on one-plus-attic floors:

ONE-FLOOR (BUNGALOW) 100 m^2	**ONE FLOOR 60 m^2 & ATTIC 40 m^2 (FINISHED)**
COMMON TRUSS	**TRUSS B & C * (FINISHED ATTIC)**
Total $52,426 $524.26/$m^2$ ($48.70/$ft^2$)	$49,542 $495.42/$m^2$ ($46.03/$ft^2$)

** The savings realized by building a finished attic are the result of lower costs for foundations, basement excavation, basement walls, upper floor construction and exterior walls.*

Example 2

Costs of putting 172 m^2 on one floor and on one-plus-attic floors:

ONE-FLOOR (BUNGALOW) 172 m^2 WITH AN EXTENSION (ADDITION)	**ONE FLOOR 100 m^2 & ATTIC 72 m^2 (FINISHED)**
COMMON TRUSS	**TRUSS B & C * (FINISHED ATTIC)**
Total $82,337 $478.70/$m^2$ ($44.47/$ft^2$)	$72,289 $420.28/$m^2$ ($39.05/$ft^2$)

** The savings realized are a result of lower costs for basement excavation, foundations, basement walls and upper floor construction.*

[1] Costs are in 1989 dollars and were estimated made by the firm of Hulbert & Associates, who assembled the material for this report.

Example 3

Costs of putting 121 m^2 on two floors and on one-plus attic floors:

TWO-STOREY HOUSE (121 m^2)	**ONE FLOOR 60 m^2 & ATTIC 60 m^2 (FINISHED)**
COMMON TRUSS	**TRUSS A***
Total $56,062	$51,587
$483.32/$m^2$ ($43.04/$ft^2$)	$429.89/$m^2$ ($39.94/$ft^2$)

** The savings realized are a result of lower costs for upper floor construction and exterior walls.*

Two examples with unfinished attic that show the advantage for first-time homebuyers.

Example 4

Costs of putting 100 m^2 (1,076 $ft.^2$) on one floor and on one-plus "unfinished" attic floors:

ONE-FLOOR (BUNGALOW) 100 m^2	**ONE FLOOR 60 m^2 & ATTIC 40 m^2 (UNFINISHED)**
COMMON TRUSS	**TRUSS B & C***
Total $52,426 $524.26/$m^2$ ($48.70/$ft^2$)	$41,770 $417.70/$m^2$ ($38.81/$ft^2$)

** The savings realized are a result of lower costs for basement excavation, foundations, basement walls, upper floor construction, roof area and exterior walls.*

Example 5

Costs of putting 121 m^2 on two floors and on one-plus "unfinished" attic floors:

TWO-STOREY HOUSE 121 m^2	**ONE FLOOR 60 m^2 & ATTIC 60 m^2 (UNFINISHED)**
COMMON TRUSS	**TRUSS A***
Total $55,062 $563.32/$m^2$ ($43.04/$ft^2$)	$42,043 $350.36/$m^2$ ($32.55/$ft^2$)

** The savings realized are a result of lower costs for basement excavation, foundations, basement walls, upper floor construction, roof area and interior finishes.*

CONCLUSION

One of the clear findings of this study is that making the attic into a habitable space provides ultimate flexibility for today's family. As it moves through the life cycle, a family can utilize this space in a variety of ways, using it for its own needs or renting it out as part of a second unit. Converting this space — by using one of several truss systems — is also economically viable, proving to be a less expensive route than either basement conversion or building an addition.

Reclaiming the attic benefits the homebuilding industry as well. By marketing this housing option, the industry will be able to meet the needs of a varying clientele. In addition, introducing an option that has so much flexibility demonstrates industry sensitivity to the needs of a diverse consumer market.

An indirect beneficiary of this housing option is the municipality, which will be assured of a stable elderly population now able to remain in familiar surroundings. Moreover, a house built with habitable attic space retains the character of a neighbourhood.

Housing with attic space that can be lived in represents housing with built-in flexibility — for the homeowner, for the homebuilding industry and for the municipality.

FOR FURTHER READING

A brief list of CMHC publications that contain information about the effective use of attic space.

Housing Choices for Older Canadians (1988).

Housing for Young Families: Conference Proceedings (to appear in 1992).

Low Cost Affordable Housing: A Bibliography (1989)

The Made-to-Convert House Video (1989).

New Made-to-Convert Housing (1988).

1990 CMHC Housing Awards: Housing for Young Families (to appear in 1992).